

REMARKS

Examiner is thanked for her review of the present application. Claims 1-13 are allowed, claims 14, 16-18 stand rejected, and claim 15 is objected to.

Claim 19 has been added to this application. Support for Claims 19 is essentially the same as that for Claim 14, and the added claim is directed to methods and systems according to the disclosure of the application as filed. Support for Claim 19 can be found, for example, on page 17, lines 5-8 of the original disclosure. This new claims is respectfully asserted not to introduce new matter, and its entry is respectfully requested. No new matter is sought to be added to the application.

Favorable reconsideration is respectfully requested.

**I. Drawing Objections: All Drawing Objections Are Traversed**

The objection to the drawing is respectfully traversed. As examiner has indicated, Figure 47 does show a reversible valve. This valve is supported by the disclosure and the claims. Claim 14 reads:

**“A method of operating a drill rig, comprising the step of using downhole circuitry to signal a change in downhole equipment condition by causing a reduction in drilling fluid long-time average pressure.”**

This claim is limited by the dependant claim 15:

**“The method of claim 14, wherein said reduction in drilling fluid long-time average pressure is caused by irreversible movement of a valve.”**

Figure 47 illustrates a reversible movement of a valve, within the scope of claim 14.

**“...the valve can be designed with a reversible movement from a first state (e.g. closed) to a second state (e.g. open) and back to the first (closed) state.”**<sup>1</sup> Previously added drawings 61 and 62 illustrate an irreversible valve consistent with claim 15. Support for these drawings is provided by the foregoing sections of the present application, the named claims, as well as within the original specification page 44, lines 10-20. Drawings must show every feature of the invention specified in the claims. However, according to MPEP 608.02(d) and 37 CFR 1.83(a) “The drawing in a nonprovisional application must show every feature of the invention specified in the claims. However, conventional features disclosed in the description and claims, where their detailed illustration is not essential for a proper understanding of the invention, should be illustrated in the drawing in the form of a

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<sup>1</sup> Application page 44, line 20-22

graphical drawing symbol or a labeled representation (e.g., a labeled rectangular box)."

Irreversible valves, by themselves, are known in the art (e.g. USPN 5,540,195).

Therefore, Applicants respectfully submit that a graphical representation, such as given in Figure 6, is sufficient to satisfy the requirements of 37 CFR 1.83(a).

## II. Review of the References

*Evans* relates to using hydraulic shock waves for telemetering logging information while drilling is in process. It is directed towards sealed bearing and gage failure.

*Randall* relates to the transformation of measurement while drilling data acquired during various time intervals into corresponding equal depth intervals.

## III. Evans does not teach or suggest "a method of operating a drill rig, comprising the step of using downhole circuitry to signal a change in downhole equipment condition by causing a reduction in drilling fluid long-time average pressure" under 35 USC § 102

Claim 14 stands rejected under 35 USC Section 102(b) as anticipated by *Evans*. A claim is anticipated only if a single prior art reference teaches each and every element of the claim (MPEP 2131). Independent claim 14 recites:

**14. A method of operating a drill rig, comprising the steps of: using downhole circuitry to signal a change in downhole equipment condition by causing a reduction in drilling fluid long-time average pressure.**

Claims 14 stands rejected under 35 USC Section 102(b) as anticipated by *Evans*. In rejecting claim 14, examiner cites *Evans* which states:

*"Previous devices which sense the condition of the antifrictions bearings are those which respond to heat and to the condition of the various wear and bearing*

*surfaces, and which are triggered by the release of excessive amounts of bearing lubricant, thereby indicating a failure if the bearing seal."*<sup>2</sup>

Examiner asserts that this section anticipates a method of operating a drill rig, comprising the step of using downhole circuitry to signal a change in downhole equipment condition by causing a reduction in drilling fluid long-time average pressure. Applicant respectfully disagrees, and points out that Evans only discloses the use of downhole circuitry, not specifically the use of the long-time average pressure. The Evans reference continues with the following passage:

*Many of the sensor devices are connected to devices which modify the pressure in the column of drilling fluid supplied through the center drilling fluid passageway in the drill string, either by increasing or decreasing the pressure of the drilling fluid."*<sup>3</sup>

This passage again lacks the claim limitation found in claim 14 of "in drilling fluid long-time average pressure." The Evans reference appears to teach an immediate response to a predetermined set of physical parameters, whereas claim 14 allows for the "downhole circuitry to signal a change in downhole equipment condition by causing a reduction in drilling fluid long-time average pressure." Therefore, since the Evans reference does not contain the limitation of the long-time average pressure, it does not anticipate the present inventions.

Express anticipation occurs when the invention is expressly disclosed in the prior art, patent or publication. In some cases, however, when the claimed invention is not described in haec verba, the "doctrine of inherency" is relied on to establish anticipation. Under the principles of inherency, a claim is anticipated if a structure in the prior art necessarily functions in accordance with the limitations of a process or method claim. In re King, 801

<sup>2</sup> Evans, Col. 1 34-36

<sup>3</sup> Evans, Col. 1 50-55

F.2d 1324, 231 U.S.P.Q. 136 (Fed. Cir. 1986). The missing claimed characteristics must be a "natural result" flowing from what is disclosed. *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 20 U.S.P.Q.2d 1746 (Fed. Cir. 1991). Unstated elements in a reference are inherent when they exist as a "matter of scientific fact". *Constant v. Advanced Micro Devices, Inc.*, 848 F.2d 1560, 7 U.S.P.Q.2d 1057 (Fed. Cir.), cert. denied, 488 U.S. 892 (1988) and *Hughes Aircraft Co. v. United States*, 8 U.S.P.Q.2d 1580 (Ct. Cl. 1988). Otherwise, the invention is not inherently anticipated.

In the present case, the Evans reference fails to teach or suggest the claimed limitation of "using downhole circuitry to signal a change in downhole equipment condition by causing a reduction in drilling fluid long-time average pressure." Further, the reference also fails to inherently teach this claimed limitation, because the taught structure of the reference does not necessarily function in accordance with the limitations of the proposed claim, as required for the doctrine of inherency to apply. Specifically, Evans is only capable of completing a circuit through the failure of parts, and functions in a passive role only, while the present invention is capable of using downhole circuitry to signal a change in downhole equipment condition by **causing a reduction** in drilling fluid long-time average pressure.

Further, as stated above, Applicants adaptive filter is capable of using downhole circuitry to signal a change in the downhole condition. The Randall disclosure is a passive device directed only towards a filter that removes data that is outside of a pre-determined margin of error, and can take no further action. Moreover, Applicants filter in some embodiments is further able to take the data that in at least one embodiment Randall discards in order to predict future signal measurements and possible bit failure. Therefore,

Randall teaches away from the use of an adaptive filter that causes a reduction in drilling fluid long-time average pressure, because it teaches towards discarding the very data that some of Applicants inventions use.

Therefore, the rejection of claim 14, under 35 U.S.C. § 102(b) has been overcome. Also, since claims 16-18 depend from claim 14, the same distinctions for claimed invention in claim 14 hold true for claims 16-18 and the rejections to these claims has also has been overcome. Applicant believes that all of these dependent claims are individually patentable, and will discuss claim 18 to illustrate this point.

**IV. The use of an adaptive filter, which analyzes data from sensors located on the drill string, is not obvious under 35 U.S.C. § 103 over Evans in view of U.S. Patent No. 5,511,037 to Randall et al. (hereinafter "Randall")**

To establish a prima facie case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations (MPEP 2142). Claim 18 depends directly from claim 14 and incorporates all the limitations thereof. Claim 18 also includes an additional limitation that the "change in downhole equipment condition is determined by an adaptive filter which *analyzes data from sensors* located on the drill string." [emphasis added]

The sensor found in Randall is designed to pre-filter data, prior to the analysis of the data:

*The prefilter is a center weighted filter of width 2l, where l is the spacing of the fine grid. The center of this filter is moved in increments of l along the depth axis containing the unevenly spaced data. If an isolated data point is within a distance of 1/2 of the center of the filter, the data point is placed at the grid point on which the filter is centered. If more than one data point falls within the filter, the data points are weighted by the filter shape, points*

*closer to the center of the filter being weighted heavier, and a weighted average data point is computed. The weighted average data point is then placed at the filter center depth.*<sup>4</sup>

This adaptive filter will actually get rid of points along the grid that are beyond the  $\frac{1}{2}$  distance point from the center of the filter. As a consequence, the filter is designed to eliminate data that is used by the present inventions. Randall notes that as *"a result of the prefiltering process, some grid points contain data while others are empty."*<sup>5</sup>

Applicant therefore respectfully submits that Randall fails to teach or suggest the claimed limitations of, "change in downhole equipment condition is determined by an adaptive filter which *analyzes data from sensors* located on the drill string." [emphasis added]

In the present inventions, the adaptive filter uses this information, rather than discarding it. For example, one embodiment is described at pg. 45, ll 19-22:

**Though the example embodiments herein described use ratios of energy or power to make their predictions or estimations, other functions can be used, such as peaks, envelope tracking, power, energy, or other functions, including exponentially weighted functions.**<sup>6</sup>

Thus, in at least some example embodiments, the term "analyzes data from the sensors" would not be taught or suggested by mere noise filtering as Randall teaches. One example of the application of this data is found in how the present inventions are capable of predicting bit failure.

**If there is a large random component in the signal being predicted, or if the nature of the signal changes rapidly, it is very difficult to successfully predict future signal values. The innovative method exploits this characteristic to detect bit failures.**<sup>7</sup>

<sup>4</sup> Col 3, ll. 63-67, Col. 4 ll. 1-6

<sup>5</sup> Col 4, ll. 7-8

<sup>6</sup> Application, pg. 45 ll. 19-22

<sup>7</sup> Application, pg. 34 ll. 25-28

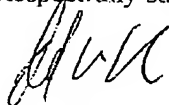
Therefore, the Randall filter teaches away from the present inventions, as the Randall filter teaches towards discarding random data in order to obtain a more normalized chart, whereas the present inventions teach the use ratios of things such as energy or power to make some of their predictions based in part upon this data. The Randall filter then seeks to eliminate data, while the current inventions filter seeks to use that data.

In view of the foregoing, Appellant respectfully submits that the cited prior art references do not establish a prima facie case of obviousness as to claim 18.

#### VI. Conclusion

Thus, all grounds of rejection and/or objection are traversed or accommodated, and favorable reconsideration and allowance are respectfully requested. The Examiner is requested to telephone the Elizabeth Pham, Patrick Holmes, or the undersigned attorney for an interview to resolve any remaining issues.

Respectfully submitted,



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17 August 2005